REMARKS

This application has been carefully reviewed in light of the Office Action dated March 14, 2002. Claims 1 to 10 are in the application, with Claims 8 to 10 having been added. Claims 1, 2 and 7, the independent claims herein, have been amended. Reconsideration and further examination are respectfully requested.

Claims 1 to 7 were rejected under 35 U.S.C. § 102 (b) as allegedly being anticipated by U.S. Patent No. 4,860,026 (Matsumoto). Reconsideration and withdrawal of the rejection are respectfully requested.

The present invention of amended independent Claims 1, 2 and 7 concerns quantization processing of image data for recording apparatus' having first and second recording means that print with, for example, light (density) and dark ink respectively. Conventionally, halftoning process have comprised performing quantization with either an error diffusion process or with a dither matrix process. It has also been known to perform recording utilizing different density inks (thin and thick ink, for example). However, in the conventional systems that utilize different density inks, application of only the dot pattern matrix (dither matrix) technique has been employed, in order to reduce the amount of time required to perform the halftoning process. As a result, the number of gradation levels that can be achieved are limited based on the size and relationship between the matrices used for the thin and the thick ink. Therefore, the image quality that can be achieved, especially for high quality photographic images, is also limited.

The present invention addresses the forgoing by applying different quantization processes for each of the different density inks, respectively. According to the invention, different quantization processes are utilized for each of first and second record

means respectively; one that conducts error correction (such as an error diffusion quantization process) and the other that does not conduct error diffusion (such as a dither matrix quantization process). In other words, image data for thick dots are subjected to a quantization process that utilizes error correction (such as the error diffusion method), while image data for thin ink is subjected to a quantization process that does not utilize error correction (such as the dither matrix method). As a result, a high quality photographic image can be processed to preserve the original image densities (due to error correction process), while at the same time easily controlling the number of dots assigned to each pixel so as to decrease granularity in the output image.

Referring specifically to the claims, amended independent Claim 1 is a quantization method in which quantization processing is applied to data for first and second recording means which record input image data in a plurality of gradations which belong to each of different gradations in substantially the same hue, comprising the steps of inputting multi-value level image data, a first quantization step of performing quantization of the image data input for the first recording means to data with a lower level than that of the input image data, the first quantization step performing the quantization by conducting error correction, and a second quantization step of performing quantization of the image data input for the second recording means to data with a lower level than that of the input image data, the second quantization step performing the quantization without conducting error correction, wherein at least one of the first and second quantization steps performs quantization of the input image data to multi-value data with 3 or more levels, so that the corresponding one of the first and second recording means may record the image in a plurality of gradations.

Amended independent Claims 2 and 7 are apparatus and storage-medium claims, respectively, that substantially correspond to Claim 1.

The applied art is not seen to disclose or to suggest the features of amended independent Claims 1, 2 and 7. More particularly, the applied art is not seen to disclose or to suggest at least the feature performing a first quantization step of image data input for a first recording means to data with a lower level than that of the input image data, the first quantization step performing the quantization by conducting error correction, and performing a second quantization step of the image data input for a second recording means to data with a lower level than that of the input image data, the second quantization step performing the quantization without conducting error correction.

Matsumoto merely discloses utilizing various dither matrix patterns with a matrix pattern for thin ink being larger than a matrix pattern for thick ink. For example, as described with regard to Figures 5-1 and 5-2, a matrix pattern for thin ink is a 6 x 6 matrix, and a dither matrix for thick ink is a 3 x 3 matrix. Combining these two matrices results in an increase in the number of gradations such that 68 gradation levels are possible. (See column 4, line 60 to column 5, line 20.) Thus, Matsumoto is not believed to disclose or to suggest at least the feature of performing a first quantization step of image data input for a first recording means to data with a lower level than that of the input image data, the first quantization step performing the quantization by conducting error correction, and performing a second quantization step of the image data input for a second recording means to data with a lower level than that of the input image data, the second quantization step performing the quantization without conducting error correction. Accordingly, Claims 1, 2 and 7 are not believed to be anticipated by Matsumoto.

In view of the foregoing amendments and remarks, the entire application is believed to be in condition for allowance and such action is respectfully requested at the Examiner's earliest convenience.

Applicants' undersigned attorney may be reached in our Costa Mesa, California office at (714) 540-8700. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

Attorney for Applicants

Registration No. 42,746

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-2200
Facsimile: (212) 218-2200
CA_MAIN 45870 v 1

APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS

1. (Amended) A quantization method in which quantization processing is applied to data for first and second recording means which record input image data in a plurality of gradations which belong to each of different gradations in [almost] substantially the same hue, comprising the steps of:

inputting multi-value level image data;

a first quantization step of performing quantization of the image data input for the first recording means to data with a lower level than that of the input image data, the first quantization step performing the quantization by conducting error correction [(hereinafter referred to as first quantization step)]; and

a second quantization step of performing quantization of the image data input for the second recording means to data with a lower level than that of the input image data, the second quantization step performing the quantization without conducting error correction [(hereinafter referred to as second quantization step)],

wherein at least one of the first and second quantization steps performs quantization of the input image data to multi-value data with 3 or more levels, so that the corresponding one of the first and second recording means may record the image in a plurality of gradations.

2. (Amended) A recording apparatus which includes first and second recording means which record input image data in a plurality of gradations which belong to each of different gradations in [almost] substantially the same hue, comprising:

input means for inputting multi-value level image data;

first quantization means for performing quantization of the image data input for the first recording means to a data with a lower level than that of the input image data, the first quantization means performing the quantization by conducting error correction; and

second quantization means for performing quantization of the image data input for the second recording means to a data with a lower level than that of the input image data, the second quantization means performing the quantization without conducting error correction,

wherein the first and second recording means record the input image data respectively in first and second gradations according to a quantization result from the first quantization means, at least one of the first and second quantization means performs quantization of the input image data to multi-value data with 3 or more levels and the corresponding one of the first and second recording means record the image in a plurality of gradations.

7. (Amended) A storage medium from which a computer can readout a control program which is used for performing quantization of data for first and second recording means which record input image data in a plurality of gradations which belong to each of different gradations in [almost] substantially the same hue, comprising:

a first quantization step module for performing quantization of the image data input for the first recording means to data with a lower level than that of the input image data, the first quantization step performing the quantization by conducting error correction;

a second quantization step module for performing quantization of the image data input for the second recording means to data with a lower level than that of the input image data, the second quantization step performing the quantization without conducting error correction; and

an output step module for outputting results from the first and second quantization steps, wherein one of the first and second quantization step modules perform quantization of the input image data to multi-value data with 3 or more levels so that the corresponding one of the first and second recording means may record the image in a plurality of gradations.